Versatile and Extensible, Continuous-Thrust Trajectory Optimization Tool, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

We propose to develop an innovative, versatile and extensible, continuous-thrust trajectory optimization tool for planetary mission design and optimization of continuous-thrust spacecraft missions. A working title for this new tool is ?Apache.? Apache will be a platform-independent and user-friendly tool that eliminates piecewise optimization. A key to Apache?s versatility and extensibility is the use of object-oriented Java language. Specific innovations and features include: * Operates in complex gravity models, * Automatically and seamlessly handles multi-body transitions, * Supports solar and nuclear electric, electrodynamic tether, solar sail and hybrid propulsion options, * Includes non-gravitational force models such as solar pressure or atmospheric drag, * Models solar occultation periods appropriately and automatically, * Calculates radiation dosage from trapped radiation belts, * Optimizes static and dynamic variables using a gradient-based algorithm to size spacecraft systems, and to select flight times and thrust-steering profiles, * Uses analytical solutions to generate a good initial guess for the optimization method, and * Written in Java to facilitate the development of an extensible architecture and promote platform independence. Apache responds directly to the subtopic call for ?continuous-thrust mission design consisting of a synthesis of trajectory, vehicle, and operations considerations,? which enables analysis capability to lead technology development.

Primary U.S. Work Locations and Key Partners
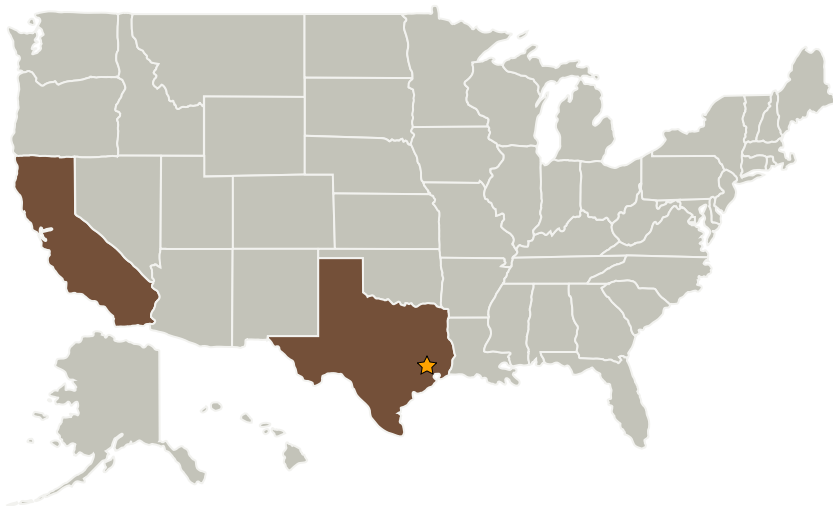
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Organizations Performing Work	Role	Type	Location
⭐Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Global Aerospace Corporation	Supporting Organization	Industry	Irwindale, California

Primary U.S. Work Locations	
California	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul A Penzo

Technology Areas

Primary:

- TX01 Propulsion Systems
  └ TX01.4 Advanced Propulsion
    └ TX01.4.1 Solar Sails

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